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Preliminary Evaluation of Individual Identification for Delta Smelt by Means of Natural Marks

Abstract: The use of external natural marks is a non-invasive approach for identifying individual animals. Natural marks could potentially allow more dependable individual identification for small fish than existing methods. We conducted preliminary tests to evaluate the use of natural marking on adult delta smelt (*Hypomesus transpacificus*). We used cultured delta smelt produced at the Fish Conservation and Culture Lab (FCCL) to evaluate the use of melanophores as natural marks. External examination of adult delta smelt in January 2012 revealed several potential areas of interest (AOI) for natural marks (dorsal view of the head and caudal peduncle, ventral view of the mandible). We selected the dorsal view of the head as the primary AOI, where melanophores are particularly common. To evaluate the short-term effectiveness of natural marks, we tagged fish with an individual alphanumeric code (VIA tags, Northwest Marine Technologies). We used a digital camera equipped with a macro lens to acquire head images. A second digital camera and a flotarium were used to obtain lateral whole body images and preliminary morphometric measurements. Initial evaluation of natural marks involved manual (naked eye) matching of digital images. We developed a qualitative matching-grade criteria to assign a measure of confidence to the manual matching process (4: excellent; 3: good; 2: fair and 1: poor). Initial results using manual evaluation for the head AOI in ten fish showed: 1) high density of pigments and pigmentation patterns, 2) variation in the size and shape of individual pigments over time, 3) a 100% correct matching of images taken one month apart and 4) excellent to good matching-grade for 80% of images and fair matching for the remaining images. These initial results justify the need for further evaluation of natural marks and the development of automated matching algorithms for adult delta smelt.

Statement of Relevance: Availability of dependable marking methods contributes to the effective management of fish populations. We evaluated the use of natural marks as an alternative to the few methods available for identifying small individual fishes such as the delta smelt, a species of environmental and management relevance in the upper San Francisco Estuary.